MULTIMEDIA UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

# SUPPLEMENTARY EXAMINATION

**TRIMESTER 1, 2015/2016**

## PMC0075 – CALCULUS

( All sections / Groups )

**17 NOV 2015**
**9.00 AM – 11.00 AM**
**(2 HOURS)**

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**INSTRUCTIONS TO STUDENT**

1. This question paper consists of 3 pages with **FIVE** questions.
2. Attempt **ALL** FIVE questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

**ANSWER ALL QUESTIONS**

**Question 1 [10 marks]**

a) Evaluate the limits:

i) $\lim_{x\to 0} 5\pi^2$

ii) $\lim_{x\to -\infty} \dfrac{5x^3+2x^2}{x^2+x+7}$

iii) $\lim_{x\to 1}\left[\dfrac{(x+1)(x-1)}{x^2-5x+4}\right]$

iv) $\lim_{x\to 0} \dfrac{\tan x}{x}$ [7 marks]

b) Given $f(x)=\begin{cases} -x^4+3, & \text{if} \quad x\le 2 \\ x^2+9, & \text{if} \quad x>2 \end{cases}$

Find:

i) $f(2)$

ii) $\lim_{x\to 2^-} f(x)$, $\lim_{x\to 2^+} f(x)$ and $\lim_{x\to 2} f(x)$

Is $f(x)$ continuous at $x = 2$ ? Justify your answer. [3 marks]

**Continued...**

**Question 2 [10 Marks]**

a) Find $\frac{dy}{dx}$ for the following functions:

i) $y = \frac{4-3x}{2x+1}$ [2 marks]

ii) $y = 3x^2e^x$ [2 marks]

iii) $x^2 = \sin(x^2+y^2)$ by Implicit Differentiation [3 marks]

b) Find $\frac{dy}{dx}$. Rearrange the function first by applying law of logarithm.

$y = \ln\left[\frac{x^2+2x}{\sqrt{2x-1}}\right]$ [3 marks]

**Question 3 [10 Marks]**

a) Compute the integral

$\int_1^2 (3-x)^2\,dx$ [3 marks]

b) Use Integration by Parts to find

$\int \ln x \; dx$ [3 marks]

c) Suppose

$$\frac{6x-9}{(x^2-1)} \equiv \frac{A}{x-1} + \frac{B}{x+1}$$

i) Find the values $A$ and $B$

ii) Hence, find $\int \frac{6x-9}{x^2-1}\,dx$ [4 marks]

**Continued...**

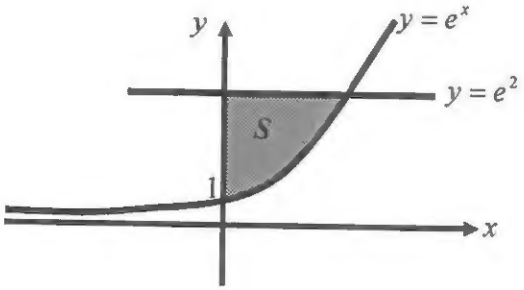
**Question 4 [10 Marks]**

a) Consider a rectangle where the sides are changing but the area is always 100 $cm^2$. One side changes at the rate of 3 cm per second when it is at 20 cm long. Find the rate of change of the other side.

[4 marks]

b) The region $S$ shown in below figure is bounded by the line $y = e^2$, the curve $y = e^x$, and the $y-$ axis. By using the washer method, find the volume of the solid generated by rotating the region $S$ about the $x-$ axis. Leave your answer in terms of $\pi$.

[6 marks]




**Question 5 [10 Marks]**

a) Solve the following differential equation by Separable of Variables Method.

$$y' \cdot (\cos 2x) = \tan 2x$$

[3 marks]

b) Given a differential equation $y'' + 4y' + 8y = 16\cos 4x$

i) Write an Auxiliary Equation and find the Complementary Solution.

ii) For Particular Solution, choose initial guess $y_p(x) = A\cos 4x + B\sin 4x$ where $A$ and $B$ are constants to find.

iii) Write the general solution of the differential equation.

[7 marks]

**End of Page**